WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS PATENT OF THE UNITED STATES IS:

1. A controlling apparatus for controlling a linear oscillation motor having a movable element and a stator one of which comprises an electromagnet with a winding, the controlling apparatus comprising:

a sensor configured to detect movement of the movable element; and

a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor.

2. A controlling apparatus according to Claim 1, wherein the sensor comprises an inducing device configured to induce voltage according to the movement of the movable element.

3. A controlling apparatus according to Claim 1, wherein the controller is configured to begin said each intermittent supply of electric power to the winding at a timing when a predetermined time has elapsed from a reference timing at which a velocity of the movable element detected by the sensor is maximum.

4. A controlling apparatus according to Claim 3, wherein the sensor comprises the winding of the electromagnet, and the controller is configured to prohibit supply of electric power to the winding during a period including the reference timing.

5. A controlling apparatus according to Claim 1, wherein the controller is configured to begin said each intermittent supply of electric power to the winding at a timing when a predetermined time has elapsed from a reference timing at which an absolute value of induced voltage in the winding of the electromagnet increases or decreases to be equal to a predetermined reference absolute value.

6. A controlling apparatus according to Claim 5, wherein the sensor comprises the winding of the electromagnet, and the controller is configured to prohibit supply of electric power to the winding during a predetermined period.

7. A controlling apparatus according to Claim 1, wherein the sensor comprises an induction inclinometer.

8. A controlling apparatus according to Claim 1, wherein the sensor comprises a photo-sensor.

9. A controlling apparatus according to Claim 1, wherein the sensor is configured to detect position, velocity and/or acceleration of the movable element.

10. A controlling apparatus according to Claim 1, wherein the controller comprises,

an output controlling device configured to control current supplied to the winding of the electromagnet, and

a drive control device configured to control the output controlling device to control a timing of current supply control.

11. A controlling apparatus according to Claim 2, further comprising an induced voltage calculator configured to calculate induced voltage in the inducing device according to the movement of the movable element based on voltage of the inducing device.

12. A controlling apparatus according to Claim 11, wherein the induced voltage calculator is configured to calculate the induced voltage based on current and the voltage of the inducing device.

13. A controlling apparatus according to Claim 10,

wherein the sensor comprises an inducing device which is configured to induce voltage according to the movement of the movable element, and

wherein the controlling apparatus further comprises an induced voltage calculator configured to calculate induced voltage in the inducing device according to the movement of

the movable element based on voltage of the inducing device, the induced voltage calculator having a plurality of equations which is used to calculate the induced voltage depending on a status of the current supply control.

14. A controlling apparatus according to Claim 10, further comprising:

an induced voltage calculator configured to calculate induced voltage in the inducing device according to the movement of the movable element based on voltage of the inducing device;

a voltage normalizing device configured to normalize the induced voltage calculated by the induced voltage calculator; and

a reference timing generator configured to generate a reference timing at which normalized voltage normalized by the voltage normalizing device is equal to a predetermined voltage.

15. A controlling apparatus according to Claim 11, wherein the inducing device comprises the winding of the electromagnet.

16. A controlling apparatus according to Claim 1, further comprising an amplitude detector configured to detect an amplitude of oscillation of the movable element based on the output of the sensor, wherein the controller is configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element when the amplitude of the oscillation of the movable element is less than a predetermined first amplitude.

17. A controlling apparatus according to Claim 16, wherein the controller is configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element during a predetermined period.

18. A controlling apparatus according to Claim 1, further comprising a driving selector through which a driving condition of the movable element is selected, wherein the

controller is configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element when a strong driving condition is selected via the driving selector.

19. A controlling apparatus according to Claim 16, wherein the controller is configured to supply maximum electric power to the winding when the amplitude of the oscillation of the movable element is less than a predetermined second amplitude which is smaller than the predetermined first amplitude.

20. A controlling apparatus according to Claim 16, wherein the controller is configured to change the supply of electric power to the winding according to the amplitude of the oscillation of the movable element.

21. A controlling apparatus according to Claim 16, wherein the controller is configured to increase a frequency of the electric power supplied to the winding and to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element when the amplitude of the oscillation of the movable element is less than a predetermined first amplitude.

22. A controlling apparatus according to Claim 1, wherein the controller is configured to intermittently supply electric power to the winding of the electromagnet to provide the movable element with force in only one direction.

23. A linear oscillation motor comprising:

a movable element;

a stator, one of the movable element and the stator comprising an electromagnet with a winding;

a sensor configured to detect movement of the movable element; and

a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controller being

configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor.

24. A linear oscillation motor comprising:

a rotor;

a stator, one of the rotor and the stator comprising an electromagnet with a winding;

a sensor configured to detect movement of the movable element;

a controller configured to intermittently supply electric power to the winding of the electromagnet to rotate the rotor periodically changing a rotational direction of the rotor, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center at which the rotor changes its rotational direction; and

an oscillatory element configured to be moved reciprocally and linearly by rotation of the rotor.

25. A method for controlling a linear oscillation motor having a movable element and a stator one of which comprises an electromagnet with a winding, the method comprising:

detecting movement of the movable element;

supplying electric power intermittently to the winding of the electromagnet to move the movable element reciprocally and linearly; and

beginning each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor.

26. A controlling apparatus for controlling a linear oscillation motor having a movable element and a stator one of which comprises an electromagnet with a winding, the controlling apparatus comprising:

sensor means for detecting movement of the movable element; and

controlling means for intermittently supplying electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controlling means

beginning each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor means.

27. A linear oscillation motor comprising:

a movable element;

a stator, one of the movable element and the stator comprising an electromagnet with a winding;

sensor means for detecting movement of the movable element; and

controlling means for intermittently supplying electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controlling means beginning each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor means.

28. A linear oscillation motor comprising:

a rotor;

a stator, one of the rotor and the stator comprising an electromagnet with a winding;

sensor means for detecting movement of the rotor;

controlling means for intermittently supplying electric power to the winding of the electromagnet to rotate the rotor periodically changing a rotational direction of the rotor, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center at which the rotor changes its rotational direction; and

oscillatory means for being moved reciprocally and linearly by rotation of the rotor.